

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
3 February 2005 (03.02.2005)

PCT

(10) International Publication Number
WO 2005/010550 A1

(51) International Patent Classification⁷: **G01S 3/04**, 3/14

Technology Centre, St Andrews Road, Malvern, Worcs.
WR14 3PS (GB).

(21) International Application Number:
PCT/GB2004/002902

(74) Agent: **A W S WILLIAMS**; QinetiQ Ltd, IP Formalities,
Cody Technology Park, A4 Building, Room G016, Ively
Road, Farnborough, Hampshire GU14 0LX (GB).

(22) International Filing Date: 5 July 2004 (05.07.2004)

(25) Filing Language: English

(81) Designated States (unless otherwise indicated, for every
kind of national protection available): AE, AG, AL, AM,
AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN,
CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI,
GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE,
KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD,
MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG,
PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM,
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM,
ZW.

(26) Publication Language: English

(30) Priority Data:
0316402.7 12 July 2003 (12.07.2003) GB

(71) Applicant (for all designated States except US): **QINETIQ LIMITED** [GB/GB]; Registered Office, 85 Bucking-
ham Gate, London SW1E 6PD (GB).

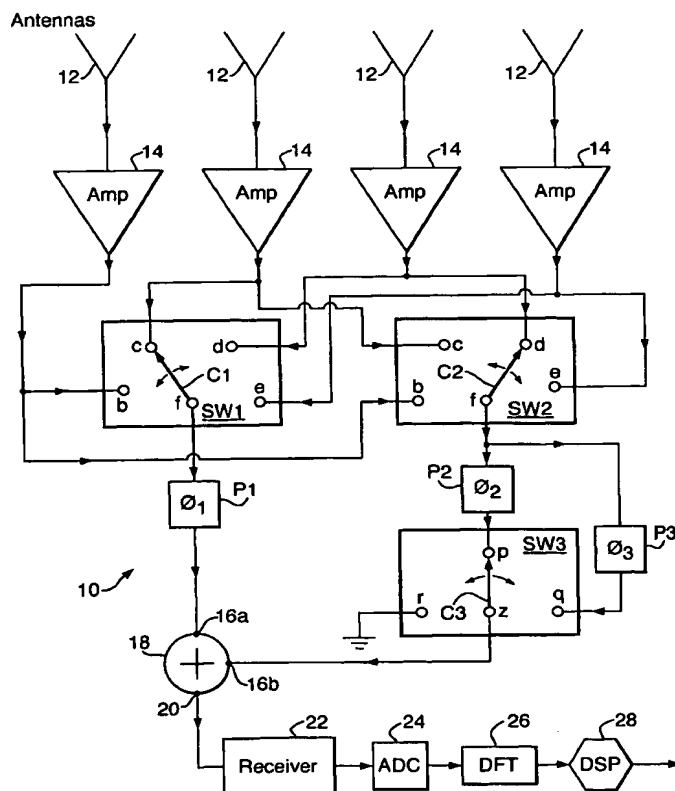
(72) Inventor; and

(84) Designated States (unless otherwise indicated, for every
kind of regional protection available): ARIPO (BW, GH,
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,

(75) Inventor/Applicant (for US only): **MACLEOD, Mal-**
colm, David [GB/GB]; QinetiQ Malvern, Malvern

[Continued on next page]

(54) Title: DIRECTION FINDING



(57) Abstract: Direction finding by radio comprises arranging an array of antennas (12), to receive signals from emitters, selecting individual antenna signals using a first multipole switch (SW1) and determining antenna signal strengths. Individual antenna signals are also selected by a second multipole switch (SW2), which routes a selected signal to a third multipole switch (SW3). The third switch (SW3) switches a phase shifter (P3) into and out of an antenna signal path. An adder (18) is employed to add an antenna signal in a first signal path extending via the first multipole switch (SW1) to a different antenna signal in a second signal path extending via the second and third switches (SW2, SW3). This determines combined signal strengths between pairs of antenna signals, one of which either has or has not been relatively phase shifted depending on the third switch position. Covariance matrix elements are determined from signal strengths enabling emitter bearings to be derived.



ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,
FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI,
SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
GW, ML, MR, NE, SN, TD, TG).

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Declaration under Rule 4.17:

— *of inventorship (Rule 4.17(iv)) for US only*

Published:

— *with international search report*